original idea was, partly by watching a storm-rain-gauge, and partly by estimation, to decide on the intensity of the rain, and to indicate that intensity by moving the pen further and further from zero as the fall becomes heavier. Experience alone will show whether that is, or is not, superior to moving it one step for each $\frac{1}{100}$th of an inch of fallen rain, which can be done by making a Crosley rain-gauge send a current into the room where the brontometer is placed, and strike a bell there. In a heavy storm there will, however, be so much for the observer to do, that very probably count would be lost. It may, therefore, be necessary to make it act automatically.

The fourth pen is actuated somewhat like a piano. On the occurrence of a flash of lightning, the observer presses a key, the pen travels slightly to the right, and flies back to zero. Referred to the automatic time-scale, this gives, to a second, the time at which the key was depressed.

The fifth pen is similar, but, being intended to record the thunder, the observer will continue to hold down the key until the roll is inaudible. The time of the departure of this pen from zero will evidently be later than that for the lightning by the time-interval due to the distance of the flash, and possibly something may be learned from the accurate record of the duration of the thunder.

The sixth pen is similar to the third, and is intended to record the time, duration, and intensity of hail.

The seventh and last pen is devoted to an automatic record of atmospheric pressure. As the rapid motion of the paper, which is indispensable for studying the details of a thunderstorm, has enlarged the time-scale more than a hundredfold, it was imperative that the barometric scale should itself be greatly enlarged. But the range of the barometer in London is more than 2½ inches, and no enlargement less than ten times the natural (mercurial) scale would be of any use; hence a breadth of 25 inches of paper would be necessary, unless some mode of shifting the indication could be devised.

Several plans were tried, but finally a modification of Richard's statoscope has been adopted, which is so sensitive that it will indicate the opening or shutting of a door in any part of the house, gives a scale of 30 inches for each mercurial inch (*i.e.* about three times that of a glycerine barometer), and yet only requires 4 inches breadth of the brontometer paper. Without entering into all the details of construction, it is desirable to explain the general principle, and its application. As it was essential that the apparatus should record accurately to 0·001 inch of mercurial barometric pressure, it was evident that friction had to be reduced to a minimum, and considerable motive power provided. This is done by placing in the base of the brontometer a galvanized iron chamber, which contains about 3½ cubic feet of air; on the upper part are a series of elastic chambers, similar to the vacuum boxes of aneroid barometers, but much larger. When the instrument is to be put in action, these chambers are connected with the large air-chamber, and a tap is closed which shuts off communication with the external air. Any subsequent increase, or decrease, of atmospheric pressure will compress, or allow to dilate, the air in these chambers, and the motion of the elastic ones produces that of the recording pen.

Obviously, any large change in the temperature of the confined air would vitiate the readings; but (1) the instrument is not required to give absolute, but merely differential, values, and (2) the influence of the changes of temperature is greatly reduced by the chamber being surrounded with 4 inches thick of non-conducting material, besides nearly 1 inch of wood outside of it. The change of temperature in a room, and during the short time that the statoscope will be worked without resetting to zero (*i.e.* without opening the tap) has not hitherto produced any measurable effect.

G. J. SYMONS.

NOTES.

THE Société de Physique et d'Histoire naturelle de Genève has decided to celebrate its hundredth anniversary. It was founded in 1790, having originated in informal meetings of eminent men of science who lived at that time in Geneva. On October 23 a special meeting will be held, at which papers will be read relating to the history of the Society and to the labours of its members. It is hoped also that some honorary members may be disposed to contribute to the success of the meeting by sending scientific communications. In the evening there will be a banquet. Members who intend to be present are asked to write to M. de la Rive, the President, some days before the celebration.

THE International Exhibition of Mining and Metallurgy, at the Crystal Palace, was officially opened on Monday by Lord Thurlow, F.R.S., one of the honorary vice-presidents of the Exhibition. We shall give some account of the Exhibition when the arrangement of the specimens is in a more forward state.

THE British Medical Association is holding its fifty-eighth annual meeting at Birmingham. The President, Dr. Willoughby F. Wade, delivered the opening address on Tuesday. On Wednesday Sir Walter Foster delivered an address in medicine; to-day Mr. Lawson Tait delivers an address in surgery; and to-morrow, at the concluding general meeting, Dr. W. H. Broadbent will speak on therapeutics. At the meeting to-day the Association's gold medal "for distinguished service" will be presented to Surgeon Parke, of the Emin Relief Expedition.

THE summer meeting of the Institution of Mechanical Engineers is being held at Sheffield. It began on Tuesday, July 29, and will not be concluded until to-morrow. The following is a list of the papers: on steel rails, considered chemically and mechanically, by Mr. Christer P. Sandberg, of London; on recent improvements in the mechanical engineering of coal-mines, by Mr. Emerson Bainbridge, of Sheffield; description of the Parkgate iron and steel works, by Mr. Charles J. Stoddart, managing director; description of the Sheffield water works, by Mr. Edward M. Eaton, engineer; description of the Loomis process of making gas for fuel, by Mr. R. N. Oakman, Jun., of London; on milling cutters, by Mr. George Addy, of Sheffield; on some different forms of gas furnaces, by Mr. Bernard Dawson, of Malvern; on the Elihu Thomson electric welding process, by Mr. W. C. Fish, of London (communicated through Prof. Alexander B. W. Kennedy, F.R.S., Vice-President).

THE Leeds Executive Committee, appointed for the purpose of making arrangements for the visit of the British Association, met on Monday. The Mayor, Alderman Elmsley, in opening the proceedings, said that some of the most eminent men of science in Europe and America had announced their intention of being present. Many of the principal manufacturers of Leeds had most generously consented to open their works for inspection by members of the Association. Arrangements had also been made for excursions to places of interest, historical or otherwise. He had no doubt that the inhabitants of Leeds would show all the hospitality and enthusiasm that was required. In the course of the proceedings it was stated that it was the original intention to have a guarantee fund of not less than £500, but that fund now amounted to not less than £6540. A report of the Executive Committee recommended that a call of 50 per cent. should be made on the guarantors, but Mr. Benson Jowitt, in moving the adoption of the report, expressed his belief that eventually it would turn out that the call had been more than sufficient to meet the demands which had been made upon it. The Vicar of Leeds, Dr. Talbot, having seconded the adoption of the report, it was carried, and the proceedings terminated.

THE National Association for the Promotion of Technical and Secondary Education has issued its third annual report. It speaks of the past year as the most eventful one of its existence, so far as the actual realization of the objects of the Association are concerned. The report will be of great interest to anyone who may wish to obtain a general view of the progress which is being made towards the establishment of a proper national system of technical and secondary education.

ATTEMPTS have been made in Parliament this week to secure that the money to be raised from the new tax on spirits shall be applied in Scotland to the establishment of a perfectly free system of elementary education. The Government declines to accept the proposal, which has, therefore, for the present been rejected. On Tuesday evening Mr. Goschen said the matter had been spoken of as a small one, but he thought the decision whether or not the standards above the compulsory standards as well as the compulsory standards themselves should be freed was by no means a very small question. The argument had been put forward that the Government would be justified in freeing parents from the duty (which hon. members now entirely discarded) of educating or contributing to the education of their children. They had relieved parents from that duty where the State had enacted compulsion, but the Government were not prepared to sanction the principle that beyond the compulsory standards education must necessarily be free. Mr. Mundella strongly supported the scheme. He pointed out that the compulsory standard varied in different districts from the third to the sixth. The compulsory standard had been fixed as a minimum, but the Chancellor of the Exchequer would tend to stereotype it, and in many places make it the maximum. Children were passing out of school at an earlier age year by year. In other countries the standard was not one of class, but of age. In Scotland children were passing the fifth standard as early as 10 or 11 years old. The payment of fees had been a great hindrance to the attendance of children at schools. That was why they were dealing with the question now. No doubt the child's wages were a great temptation, but the fee might just make the difference to a poor parent in deciding whether to keep his child at school or not. The present system was a great hardship on precocious children who passed the fifth standard at an early age.

THE Board of Agriculture announce that they have received information reporting the presence of the Hessian fly in the counties of Lincoln, Suffolk, and Herts slightly, and badly near Errol, in Perthshire. Owing to the twisted condition of much of the corn, it is more than usually difficult to detect the presence of the insect. Information is being prepared, and will at once be circulated by the Board.

THE returns presented to the Middlesex County Council by the various inspectors under the muzzling order show that during the quarter ending June last five dogs were seized with rabies in the county, as against seven in the previous quarter. But for the number of cases of rabies the Board of Agriculture would have been asked to withdraw the order. During the same period 526 dogs were seized, 87 of which were claimed and the remainder slaughtered. These figures compare with 1039, 108, and 946 respectively for the March quarter. The total number of dogs seized in the year was 3250, of which 488 were claimed and 2634 slaughtered. In the same period there were 49 cases of rabies, as against 22 in the previous year.

THE trustees of the South African Museum, in their Report for the year ended December 31, 1889, say that in the course of this period valuable assistance was rendered in the palæontological section by Prof. H. G. Seeley, F.R.S., who, during his brief visit to the colony, examined the South African fossils in the Museum, and determined and labelled a considerable number of them. The trustees were glad to learn that Prof. Seeley discovered in the Museum series an apparently new genus, and they had much pleasure in intrusting to his care some of the most interesting specimens for further investigation in England.

WE learn from the *Bulletin* of the Torrey Botanical Club that, through the cordial co-operation of the officers of the New York State Fish Commission, and the great personal interest of its President, Mr. Eugene Blackford, the Brooklyn Institute has been enabled to open a sea-side laboratory for teaching and research in zoology and botany, under the direction of Dr. Bashford Dean. The laboratory is located at Cold Spring Harbour, Long Island, 32 miles from New York, reached by the Long Island Railway. The session opened on July 7, and was to extend over eight weeks; the fee is 24 dollars. The location is described as a capital one, and an extensive corps of lecturers on special subjects has been secured, those on the botanical side being Dr. W. G. Farlow, Dr. N. L. Britton, and Prof. Byron D. Halsted.

THE death is announced of Dr. Alexander von Bunge, the veteran Professor of Botany at the University of Dorpat, at the age of 87 Dr. von Bunge was engaged, in the year 1830, in a scientific expedition in China, and subsequently in Khorassan and Afghanistan. His speciality of recent years was the flora of Russia and of Northern Asia. He was a foreign member of the Linnean Society of London.

SHOCKS of earthquake have lately been felt in different parts of Austria-Hungary. On July 23 two violent though short shocks took place in the Muehl district, in Upper Austria, and on July 25 a violent shock occurred in the valley of the Tscherna, in Moravia. A telegram received at Budapest from Mehadja on July 25 announced that two violent shocks of earthquake had been felt at the Hercules Baths, near that place, at half-past 11 on the previous night. The direction of the disturbance was from east to west.

THE Paris Museum of Natural History received recently from M. J. Bretonnière an interesting sample of limestone (from the suburbs of the town of Constantine in Algeria) in which there are a number of excavations, due apparently to *Helicidæ*. M. Stanislas Meunier thinks that land-snails are enabled to penetrate the rock through the agency of the siliceous particles which were shown by Hancock in 1848 to be the instruments used for similar work by some marine mollusks.

IN his recent thesis on the influence of the sea-shore on leaves M. Pierre Lesage shows by conclusive evidence that a marine, habitat leads to a thickening of the leaves. The palissade-cells are more numerous and larger than in the leaves of the same plants grown inland. Apparently the sea-salt is the cause of this alteration, as plants cultivated in artificially salted soil yield thicker leaves. The observations of M. Lesage bear on some ninety species of plants which are in their natural state found near the sea (in Brittany) as well as inland.

AN excellent paper on the Peabody Museum of American Archæology and Ethnology in Cambridge, U.S., by Frederick W. Putnam, has been reprinted from the Proceedings of the American Antiquarian Society, October 23, 1889. Mr. Putnam, dealing with the problems suggested by the collections of the Museum, thinks that the following are the elements to be taken into consideration in any endeavour to trace the present North American tribes and nations back to their origin. First, small oval-headed Palæolithic man. Second, the long-headed Eskimo. Third, the long-headed people south of the Eskimo. Fourth, the short-headed race of the south-west. Fifth, the Carib element of the south-east. All these elements, Mr. Putnam holds, must be studied with their differences in physical characteristics, in arts, and in languages. "From a commingling of all," he says, "with greater or less predominance of one over the other, uniting here and subdividing there, through many thousand years, there has finally resulted an American people having many characteristics in common, notwithstanding their great diversity in physical characteristics, in arts, in customs, and in languages. To this heterogeneous people the name Indian was given, in misconception, nearly four hundred years ago, and now stands as a stumbling-block in the way of anthropological research; for under the name resemblances are looked for and found, while differences of as great importance in the investigation are counted as mere variations from the type."

The Royal Society of Victoria has issued the second part of the first volume of its Transactions. Baron von Mueller begins this collection of papers with important "records of observations on Sir William Macgregor's highland plants from New Guinea." Mr. Arthur Dendy writes on the anatomy of an Australian land planarian; Prof. W. Baldwin Spencer on the anatomy of *Amphiptyches urna* (Grube and Wagner). A paper on the preparation of alkyl-sulphine, selenine, and phosphonium salts is by Prof. Orme Masson. Mr. A. W. Howitt, in a well-arranged and instructive paper, deals with the organization of Australian tribes. The following are among Mr. Howitt's conclusions:—(1) The group is the sole unit. The individual is subordinate in the more primitive form of society, but becomes more and more predominant in the advancing social stages. Thus group marriage becomes at length completely subordinate to individual marriage, or even practically extinct and forgotten where descent has been changed from the female to the male line. (2) An Australian tribe is not a number of individuals associated together by reason of relationship and propinquity merely. It is an organized society governed by strict customary laws, which are administered by the elder men, who in very many, if not in all, tribes exercise their inherited authority after secret consultation. (3) There are probably in all tribes men who are recognized as the headmen of class divisions, totems, or of local divisions, and to whom more or less of obedience is freely given. There are more than traces of the inheritance by sons (own or tribal) of the authority of these headmen, and there is thus more than a mere foreshadowing of a chieftainship of the tribe in a hereditary form. (4) Relationship is of group to group, and the individual takes the relationship of his group, and shares with it the collective and individual rights and liabilities. The general result arrived at is that the Australian savages have a social organization which has been developed from a state when two groups of people were living together with almost all things in common, and when within the group there was a regulated sexual promiscuity. The existence of two exogamous intermarrying groups seems to Mr. Howitt to almost require the previous existence of an undivided commune from the segmentation of which they arose.

At the meeting of the Royal Society of Tasmania on May 20, Mr. Morton drew attention to a recent dredging trip in the harbour. The result of the dredging trip was of important interest, as the forms obtained resembled the marine fauna of Port Jackson. Among the specimens dredged were a large number of mussels, and each contained a small crab, which on examination appeared to belong to the genus Fabia. It was rather curious to learn from some of the old residents that many years back, when mussels were numerous as at present, in the majority of cases every mussel contained a crab similar to those exhibited, and that the oysters, while mussels were in large quantities, were few. Some time afterwards the mussel became nearly extinct, while the oyster multiplied. Whether that was due to this parasitical crab or not he was unable to say, but the fact was singular that while the crab was now noticeable in the mussel the oyster was increasing in numbers. Whether history would repeat itself it would be difficult to say, but it would be interesting to observe the result.

The trustees of the State Museum of Natural History, New York, have issued their forty-first Annual Report. It is accompanied by the reports of the director, the State botanist, the State entomologist, and the State geologist. The directors call attention especially to the important and beautiful collection of minerals and gems bought for the Museum from Mr. George F. Kunz. They describe this collection as "one of the most perfect to be found in any American museum."

In the seventh volume of the "Bulletin of the U.S. Fish Commission," lately issued, Dr. W. R. Hamilton has an interesting note on the croaking or grunting noise made by the "Perch" (*Haploidonotus grunniens*). This fish is furnished with a masticatory apparatus in the gullet, and the lower division of this has its upper surface flat and triangular in outline, and studded all over with spheroidal "teeth," if they may be called genuine teeth. The upper division is composed of two parts united by a ligament; their lower surfaces are also supplied with similar teeth. The divisions of this apparatus have powerful muscles attached to them by which they can be pressed together and moved laterally on each other. By this process the fish masticates the crustaceans on which it feeds. When this action takes place, the croaking is produced by the teeth coming in contact and gliding over each other. About twenty years ago, being interested in this subject, Dr. Hamilton procured from an Ohio River fisherman a perch weighing 18½ pounds, which he declared was the largest perch he had ever caught. Dr. Hamilton divided the head on one side, and thus exposed its masticatory apparatus; and while he moved its grinders as he supposed the fish had done during life when crushing a crawfish, an exact imitation of the croaking sound was produced.

The Committee of the Felsted School Natural History Society, in issuing their eighth annual report, are able to congratulate the Society on a large increase of members during the past year. The members seem to give a good deal of attention to scientific study, but the Committee "continue to lament the very serious diminution of the old collecting spirit once so rife in the school, and to hope for its return." They attribute this defect to "compulsory games."

Messrs. Dean and Son announce for publication "Berge's Complete Natural History of the Animal, Vegetable, and Mineral Kingdoms." It will be edited by R. F. Crawfurd, and illustrated with about 400 coloured plates and woodcuts.

Part 22 of Cassell's valuable "New Popular Educator" has been issued. The number is accompanied by a map of Africa, and there are, as usual, many illustrations.

The new number of the Journal of the Royal Agricultural Society of England (third series, vol. i. part 2) begins with an article, by Mr. D. Pidgeon, on the development of agricultural machinery. This is followed by articles on the agricultural lessons of "the eighties," by Prof. Wrightson; the Report of the Royal Commission on Horse-breeding, by Lord Ribblesdale; tuberculosis in animals, and its relation to consumption in man, by Mr. W. Duguid; fifty years of hop-farming, by Mr. Charles Whitehead; the best means of increasing the home-production of beef, by Mr. G. Murray; and the herbage of pastures, by Dr. W. Fream.

The Meteorological Office of Calcutta has just issued Part II. of "Cyclone Memoirs," containing a full description of a very violent cyclonic storm which passed through Bengal from August

21 to 28, 1888, written by Mr. A. Pedler. The text is accompanied by eighteen plates, giving the general meteorological conditions, and showing the track of the storm-centre day by day. Mr. Pedler states that this storm fully bears out the condensation theory of the formation of cyclones. It was formed over an area where comparatively low pressure had for some time been persistent, and there is abundant evidence of heavy rain falling over the district in which the storm was developed, and to the south of it. Several points of interest are referred to in the discussion, viz. the irregular cyclonic circulation of light winds near the centre of the storm, with a violent circulation of the clouds above these light winds, and these conditions appeared to shift their position, like an eddy; secondly, the sudden change from light winds to winds of hurricane force, extending chiefly in the southerly direction. Also the entire absence of a calm centre, and the fact that the lowest barometric pressure was recorded from ten to fourteen hours after the storm centre (as judged by the winds) had passed. The storm was remarkable for the slight barometric depression which accompanied it, considering the excessive force of the winds.

DR. R. J. SÜRING, of the Meteorological Office, Berlin, has submitted to the Friedrich-Wilhelms Universität, on the occasion of his taking his diploma, a useful paper on "the vertical decrease of temperature with height in mountainous districts, and its dependence upon the amount of cloud." In most works upon this subject, the special effect of cloud upon temperature has been limited to very moderate heights; in this paper the author has carefully investigated the observations at mountain stations up to about 4100 feet. The results arrived at are:—(1) In the morning, when the weather is clear, there is a constant tendency to an inversion of temperature. In summer this tendency extends to some 1650 feet, and in winter considerably higher. This condition recurs in the evening in a smaller degree. (2) If the sky is overcast, neither a daily nor yearly period of the vertical gradients is strongly marked. (3) A departure from the law of direct proportional decrease of temperature with height occurs chiefly during the morning hours of clear days—the change of temperature then takes place more slowly in the lower strata of air than in the upper—and on cloudy days, during the warm season, when, in the lower strata, the vertical decrease of temperature appears to be accelerated.

THE Allahabad *Pioneer* reports the result of a recent expedition to investigate the upper course of the Irawadi, the source of which, as is well known, is one of the still unsolved problems of geography. It has long been known from native report that two rivers, the Mali Kha and the Meh Kha, the former from the north, the latter from the east, unite a little below lat. 26° to form the Irawadi. The sources of the Mali Kha are known to be in the mountains to the east of the Brahmakund, which form the south-eastern water-parting of the Lohit Brahmaputra; but the Meh Kha, which is stated to be the larger stream, and which Colonel Walker supposes to be identical with the Lu River of Tibet, has never before been seen by any European. The junction of these two rivers has now for the first time been reached by an expeditionary party ascending from Bhamo. On May 27, Captain Barwick, of the Indian marine, accompanied by Mr. Shaw, the Deputy Commissioner of Bhamo, and Major Fenton, of the Intelligence Department, left Bhamo in the *Pathfinder*, a paddle-steamer of about 35 tons, with a view to reaching the point of confluence. From Bhamo as far as Maingna the stream is well known. Above Maingna the river runs between mountains from 1200 to 2000 feet high, and a succession of rapids has to be passed through, which by dint of hard struggling and after many attempts the *Pathfinder* successfully ascended, not, however, without several hairbreadth escapes from foundering, the whirlpools simply taking charge of the vessel. After six days' steaming, the party reached the confluence of the streams, distant about 150 miles from Bhamo. Here the river was found to be 500 yards wide, one branch, the Mali Kha, trending to the north-eastward, the other, the Nmaika (Meh Kha of the map), to the eastward. Up the former the explorers proceeded some six miles, and then came upon a series of rapids. It was decided not to go further, as the small quantity of fuel remaining was reserved for steaming up the other branch. A halt of a day was made, and the position fixed in lat. 25° 56′ N., and long. 97° 38′ E. Returning to the confluence, Captain Barwick proceeded three miles up the Nmaika, when a rapid prevented further progress. The Kachins are said to have been very friendly, though they had never seen or been in communication with Europeans before.

THE recent expedition to the Bellenden Ker Range (says the *Colonies and India*) has added a long and interesting list of new specimens of Australian flora to Queensland. Since the publication of the official report the Queensland Government Botanist (Mr. F. M. Bailey) has discovered ten more new plants, making a total of forty-one species entirely new to botanical science, and the collection is not yet exhausted. There are also several specimens of mosses and lichens, which so far have remained untouched, Mr. Bailey having had no time up to the present to devote to their examination. The total number of new species will probably extend to fifty—a result far exceeding that of any previous Australian botanical expedition. In the 1889 report of the proceedings of the Linnean Society of New South Wales there is an account of four new specimens to be added to the list of those discovered by the Bellenden Ker expedition. One of these belongs to the genus *Coccincillidæ*, and has been named *Chilocorus Baileyi*, after the Queensland botanist. A large and remarkable dark blue earthworm, over seven inches long, has been named *Perichæta terræ-reginæ*—the latter a rather pedantically inflated version of *Queenslandia*. The worm was found by Mr. Meston on the top of the Herberton Range, at 2700 feet, and given to the Brisbane Museum. Two Bellenden Ker lizards of a genus new to Australian herpetology have been named by Mr. C. W. de Vis, Curator of the Queensland Museum. They belong to the order *Geckonidæ*, and are called respectively *Tropidophorus Queenslandiæ* and *Perochirus Mestoni*, the latter after the discoverer.

AN experimental study of the transpiration of plants has been recently made (we learn from *Humboldt*), by Herr Eberdt, of Marburg. The general method was to periodically weigh an air-tight vessel containing the roots of a plant (chiefly *Asclepias incarnata*, *A. Cornuti*, or *Mercurialis perennis*) in water, while the organs of transpiration projected. Absorption was also measured by means of a graduated capillary tube. We may note the following points:—The absorption and emission-values did not generally differ much. Increase of transpiration by sunlight occurred though the latter had parted with its heat-rays by passage through an alum solution; but when, after action of diffuse daylight, the dark heat-rays of sunlight (passed through a solution of iodine in carbon-sulphide) were thrown on the plants, transpiration was also increased. Direct sunlight causes more emission than absorption (shown by a relaxed appearance of the plant); and on passage into duller light, the emission falls off more quickly than the absorption, and the plant freshens. In plants with strong cuticle or few stomata, there was but little increase of transpiration from drying the air in a bell-jar over the plant by means of a dry air-current. The stomata of *Trianea bogotensis*, being watched through a microscope while light- and heat-rays were thrown on the plant from above, they were seen to open more slowly if the heat-rays were cut off; but with heat-rays alone they remained closed. If opened in light, they remained open when the heat-rays acted alone, and closed when these too were stopped. A sooty metallic plate at 30° to 25° held 3 to 5 seconds over the leaf opened the stomata, while dark heat-rays of sunlight failed to do so. The stomata opened also on passing a stream of warm, nearly saturated, air over the leaves. A shaking of plants acts not by way of shock, but by changing the atmosphere about the leaves, and therefore like wind. Strong shaking stimulates transpiration; while weak vibration has no perceptible effect. The effect of wind was studied by directing air-currents of measured strength on the plants. The action of the weaker currents proved proportionally greater than that of stronger. The transpiration is greater if the leaves are free to be moved than if they are fixed.

The additions to the Zoological Society's Gardens during the past week include two Ravens (*Corvus corax*), British, presented by Mr. Walter Chamberlain, F.Z.S.; two Wheatears (*Saxicola œnanthe*), two Whinchats (*Pratincola rubetra*), two Great Tits (*Parus major*), British, presented by Mr. J. Young, F.Z.S.; a Cuckoo (*Cuculus canorus*), British, presented by Mr. Valentine Marks; a Black Tortoise (*Testudo carbonaria*) from Jamaica, presented by Master Morris Blake; a Dwarf Chameleon (*Chamæleon pumilis*) from South Africa, presented by Mr. H. Tholen; a Brazilian Hangnest (*Icterus jamaicai*), two Bluish Finches (*Spermophila cærulescens*), a Tropical Seed-Finch (*Oryzoborus torridus*), a Thick-billed Seed-Finch (*Oryzoborus crassirostris*) from Brazil, a Black-faced Kangaroo (*Macropus melanops* ♂) from South Australia, deposited; a Thar (*Capra jemlaica* ♀), two Mule Deer (*Cariacus macrotis* ♀ ♀), five Cuming's Octodons (*Octodon cumingi*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

Objects for the Spectroscope.

Sidereal Time at Greenwich at 10 p.m. on July 31 = 18h. 37m. 53s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 4447	—	Bluish-green,	18 49 27	+32 53
(2) D.M. + 31° 3199 ...	5	Yellowish-red.	18 7 46	+31 23
(3) 70 Ophiuchi	4	Yellow.	17 59 54	+ 2 32
(4) o Herculis	4	Bluish-white.	18 3 18	+28 45
(5) 219 Schj.	8	Red.	18 43 57	− 8 1
(6) V Coronæ	Var.	Yellowish-red.	15 45 35	+39 54

Remarks.

(1) The well-known Ring Nebula in Lyra, which has been described in great detail by various observers. The spectrum consists of bright lines, but the line near λ 500 is the only conspicuous one. When the image of the nebula is sharply focussed on the slit, the chief line is seen as two bright dots connected by a faint line, indicating that nebulous matter fills the interior of the ring. (This is also confirmed by the telescopic appearance.) The line F and the one near λ 495 are exceedingly faint, but they are undoubtedly present. In my own observations, with a 10-inch refractor, I have also glimpsed a less refrangible line, but have not been able to determine its position with any degree of accuracy. Further investigation of this line should be made with as large an aperture as possible. It is not far from *b*.

(2) D'Arrest and Duner agree in describing the spectrum of this star as one of Group II. with well-developed bands. The bands at the red end are the strongest, indicating that the star is well advanced in condensation. The bands in the red are the last to disappear in passing to stars like α Tauri, and hence this conclusion. As in similar stars, the line absorptions at this stage afford an interesting study. We do not know yet, for instance, the stage at which the hydrogen lines first appear, although we now certainly know that they are present in α Orionis. The same also applies to D and *b*.

(3) The integrated spectra of the components of this double star present an appearance similar to that of a well-developed star of the solar type. No attempt has apparently yet been made to separate the two spectra. This should be done, if possible, and the usual more detailed observations as to whether the temperature is increasing or decreasing should be made.

(4) A star of Group IV. (Gothard).

(5) According to the observations of Dunér, this star has a fine spectrum of Group VI., the principal bands being very wide and dark. In addition to these, the secondary bands 4 and 5 (λ 589 and 576 respectively) were easily seen, and band 2 (λ 621) was also feebly visible. What is most required in this group of stars is a very detailed examination with the largest possible apertures. If such be undertaken, particular attention should be given to the presence or absence of line absorptions.

(6) This variable is chiefly of interest because its spectrum is one of Group VI. We have as yet no knowledge, as we have in the case of variables of Group II., of the variations of spectrum which accompany the increase of light at maximum. The range of variation in V Coronæ is very considerable—7·5 to 12 in a period of about 357 days; and it is not unlikely that well-marked changes may take place in the spectrum. Dunér states that the carbon band near λ 564 is weaker than that near λ 517, and that the secondary bands are not visible; but he gives no indication of the magnitude of the star at the time of his observation. Prof. Lockyer's investigations appear to indicate that the dark carbon bands should be proportionately less strongly marked at maximum than at minimum. There will be a maximum about August 5.

A. Fowler.

Distribution of the Perihelia of Comets.—In 1880, Dr. Henry Muirhead directed attention to the arrangements which the perihelia of comets exhibit in relation to the sun's line of flight, and pointed out that, taking the twenty-two comets given in the "Encyclopædia Britannica" along with thirteen others whose elements were given in Nature up to the date of his communication, and arranging them according to their heliocentric longitudes, the perihelia were seen to be crowded into the quadrants which the sun's line of flight bisects, as compared with those taking place in the quadrants flanking the said line (Proceedings of the Philosophical Society of Glasgow, vol. xiii.). By examining the succeeding volumes of Nature, Dr. Muirhead has obtained the heliocentric longitudes of the perihelia of forty-one more comets, and in a communication to the Philosophical Society of Glasgow, on February 5, 1890, he showed that they also exhibit the same tendency to cluster near heliocentric longitudes 263° and 83°—that is, the longitude of the "apex" and "quit" of the sun's way adopted by him.

It will be remembered that Mr. H. S. Monck, in a letter to the *Observatory*, in December 1888, remarked that, in examining catalogues of comets, he found 177 comets with perihelia north of the ecliptic, against 115 with southern perihelia. With respect to this circumstance, Mr. Monck wrote:—"Our observing stations are chiefly situated in northern latitudes. Comets are rarely visible when very remote from their perihelia; therefore, comets which pass their perihelia north of the ecliptic are more likely to be detected and observed than comets which pass their perihelia to the south of it. . . . As the point towards which the sun is moving lies to the north of the ecliptic, it might be expected that more comets would, on the whole, come to us from the north than from the south. But a comet coming from the north will usually have its aphelion north and its perihelion south. The fact that three-fifths of the comets have their perihelia to the north and their aphelia to the south thus becomes more significant, and I can hardly regard it as *wholly* the result of the position of our observing stations."

Later, however (August 1889), Dr. Holetschek drew attention to a pamphlet "Ueber die Richtungen der grossen Axen der Cometenbahnen," in which he shows that "the tendency of comet perihelia or aphelia to accumulate rather in small latitudes, and about the longitudes 90° and 270° than in other places, can be explained by purely terrestrial considerations, and, consequently, this accumulation offers no proof of the motion of the solar system or of the ultra-solar origin of comets." In fact, it appears that the distribution in latitude of the perihelia of comets is nearly uniform, and has not a marked maximum in the latitudes of the sun's line of flight, although, as Dr. Muirhead indicates, a clustering of aphelia and perihelia occurs near the heliocentric longitude of the line.